PHENIX

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Co-spokespersons

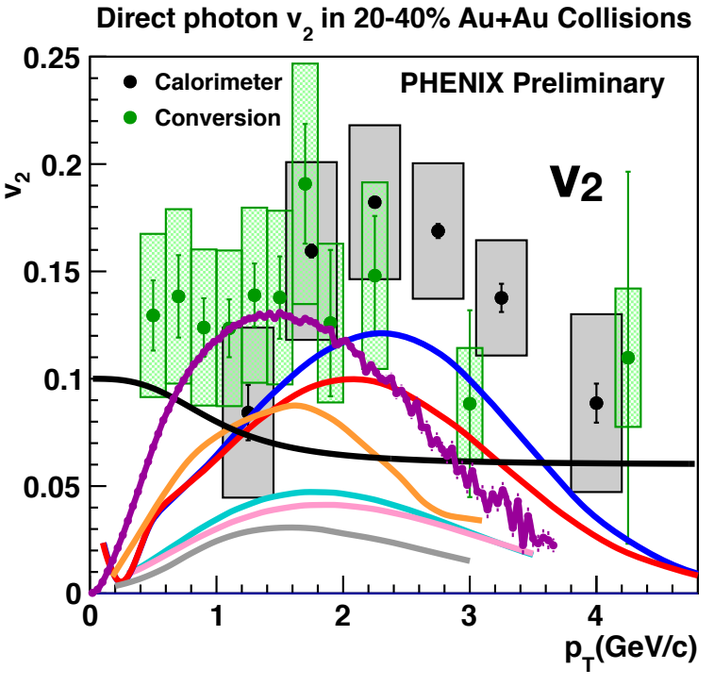
Recent accomplishments

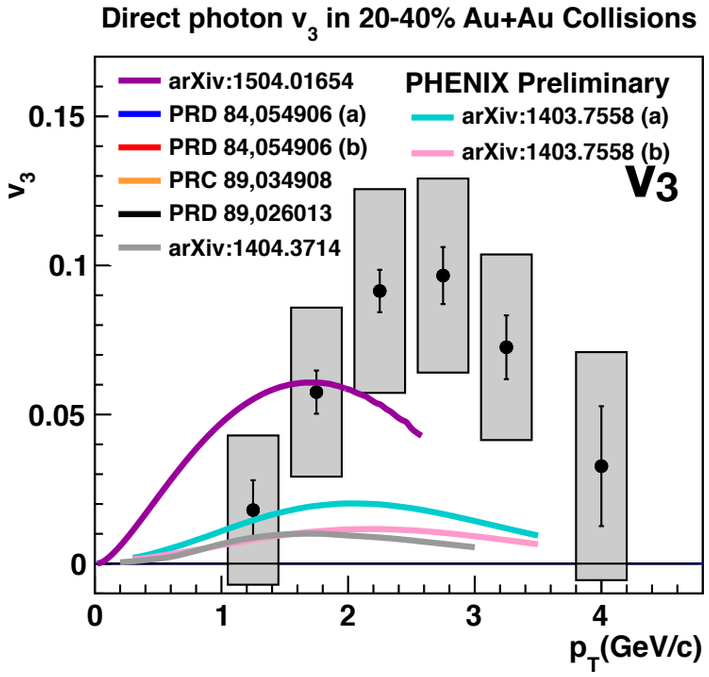
- Published 15 papers in last 12 months
- The MPC-EX successfully installed, commissioned and operated in Run-15
- High multiplicity trigger for *p+p* to look for near-side ridge – only seen by CMS so far
- Submitted sPHENIX proposal, reviewed in April 2015
- Wide range of impactful physics results - two examples on next slides

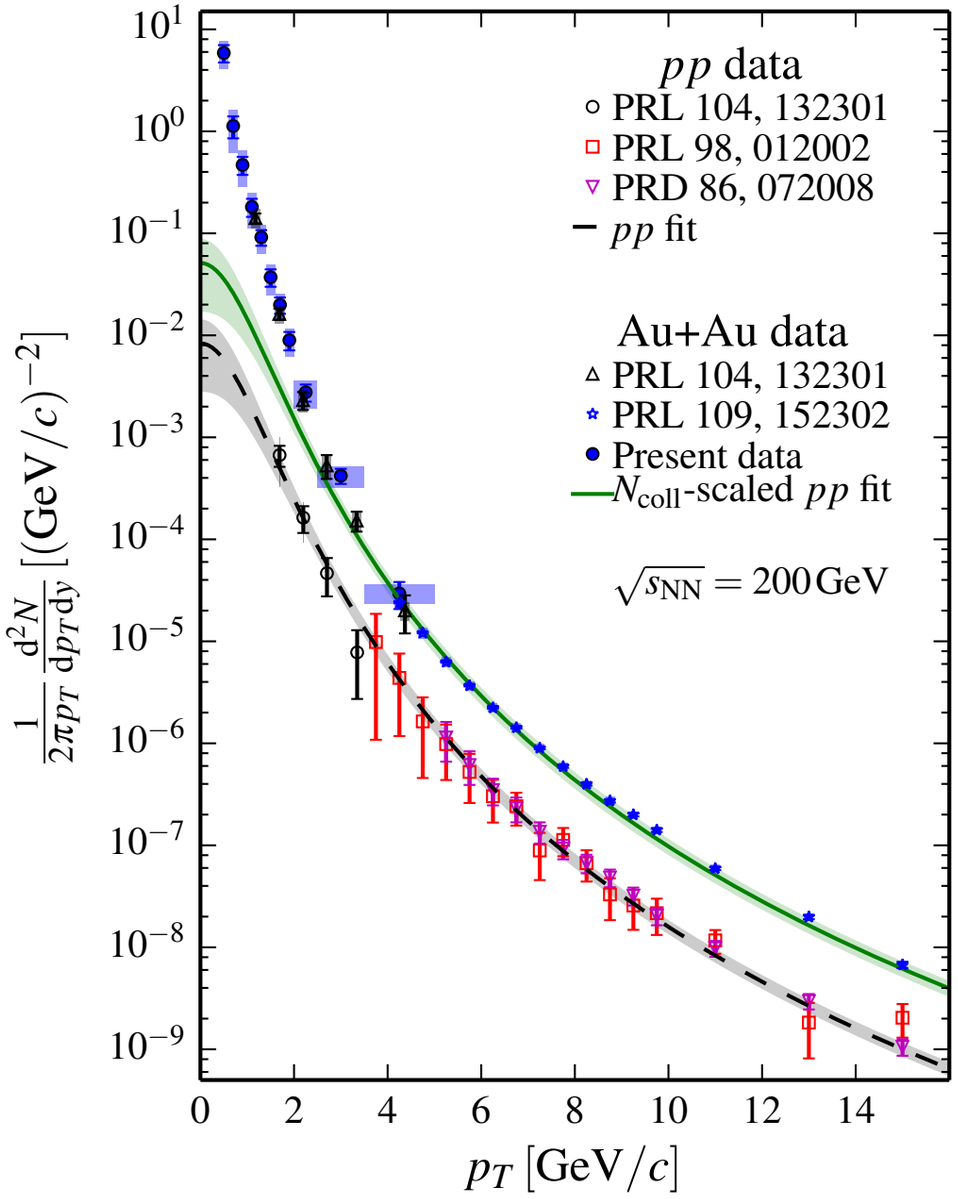
The challenge of photon yields and anisotropy

Direct photons to low p_T in Au+Au

Phys. Rev. C 91, 064904 (2015) – Editors' Suggestion







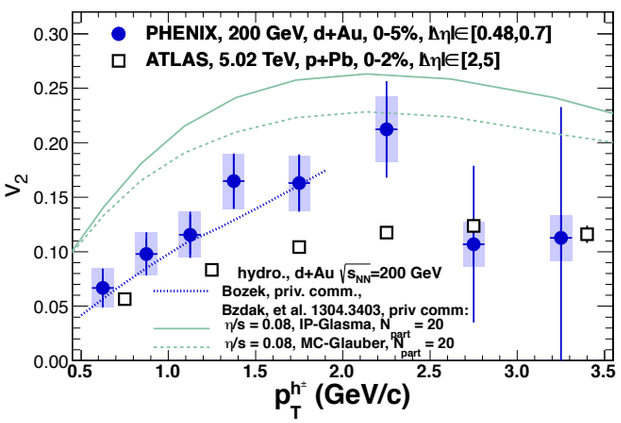
External conversion technique – down to 400 MeV/c – improves on QM'11 result

Continues to be a challenge to describe photon yields and v_2, v_3 simultaneously

Tension between high yield at early time and high temperature and high v_2 and late time to develop flow

Geometry and small systems: initial and final state

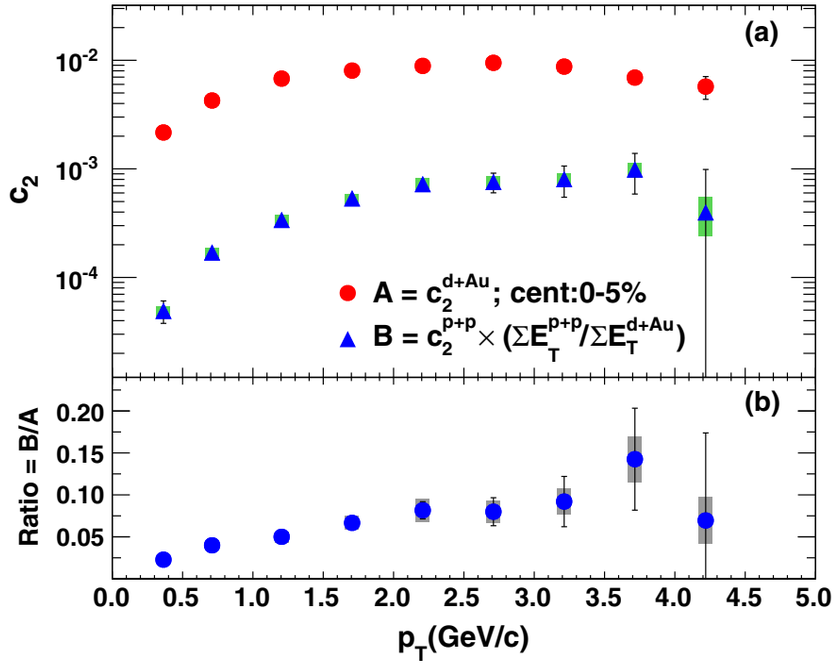
Azimuthal anisotropy in d+Au
Phys. Rev. Lett. 111, 212301 (2013)

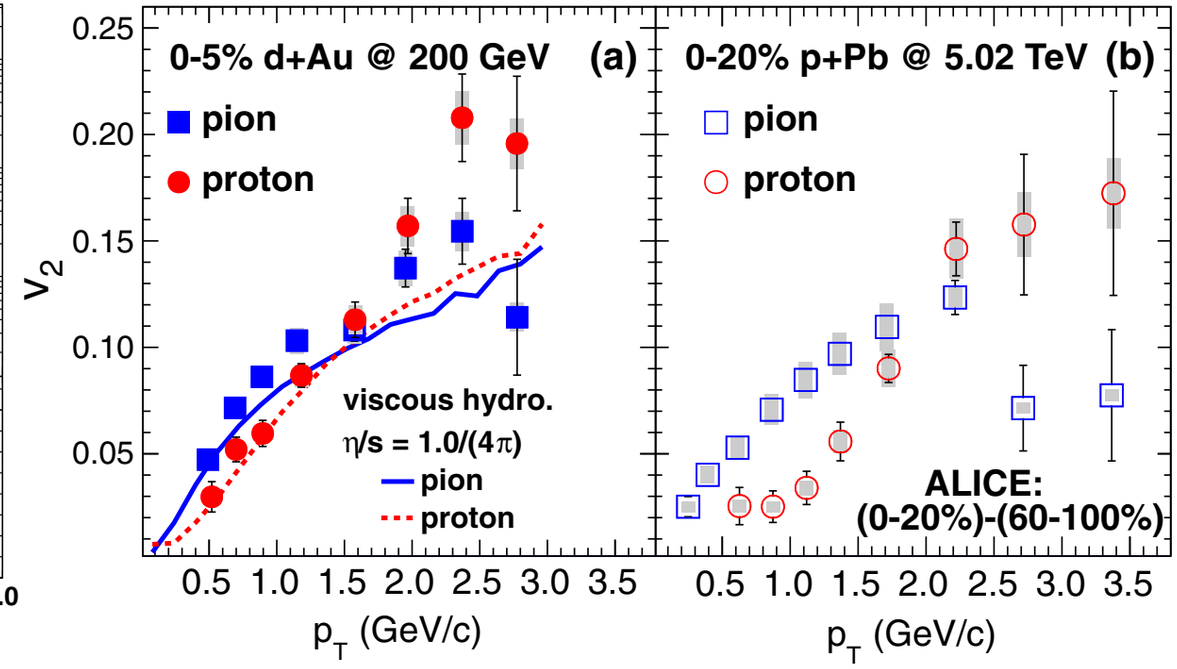


Long-range azimuthal anisotropy in d+Au
Phys. Rev. Lett. 114, 192301 (2015) – Editors' Suggestion

central arm tracks correlated with MPC towers – large Δη separation

v_2 with PID, MPC used to determine reaction plane





Azimuthal anisotropy in d+Au via two-particle correlations triggered by LHC p+Pb
Confirmed via large Δη separated measurement (uses MPC)

Managing the collaboration in the mid-term

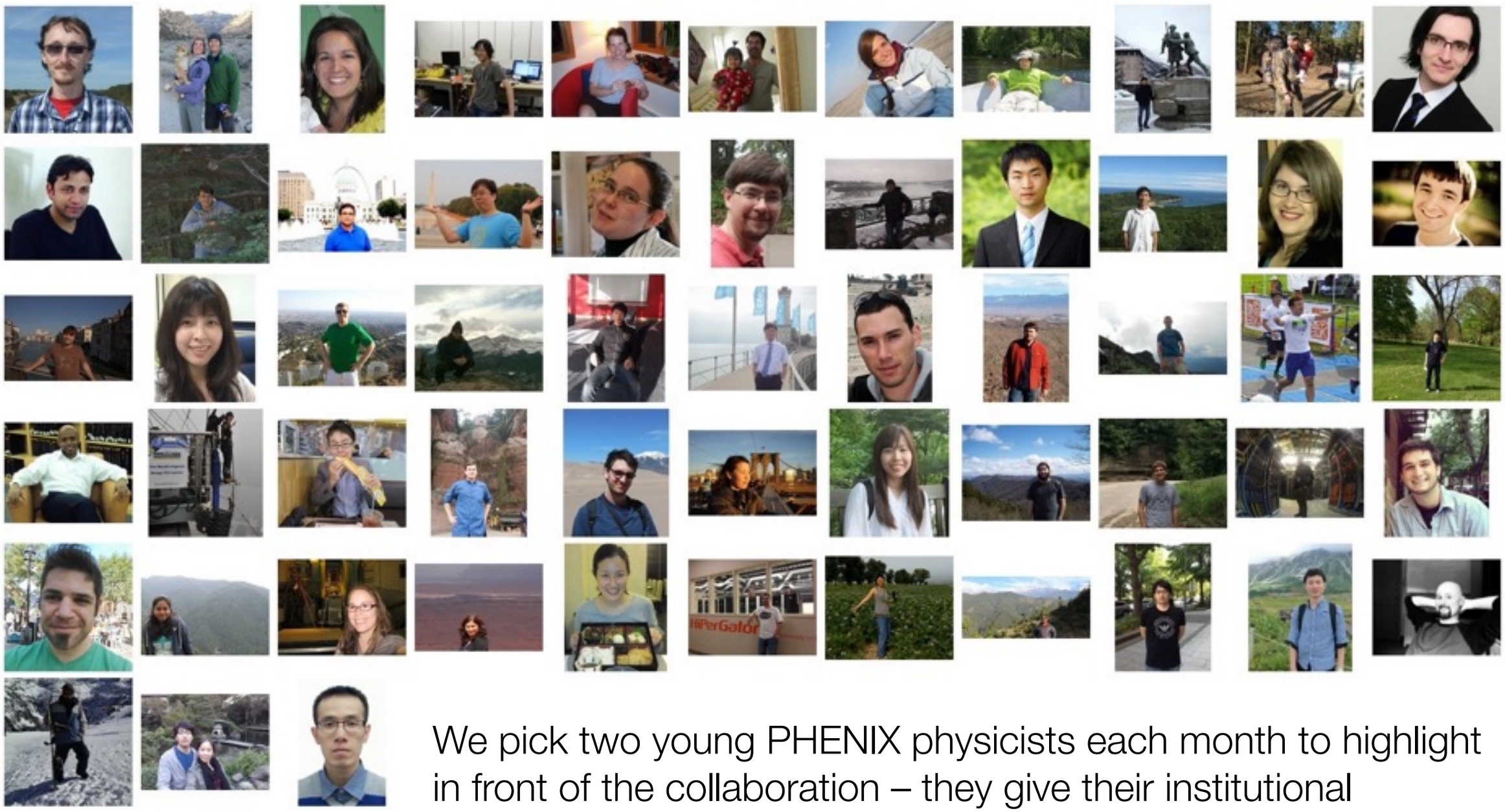
- New institutions: MEPHI, Zagreb
    - No longer encouraging institutions to join PHENIX, but to focus on sPHENIX as new collaboration

- Involve collaboration in developing compelling science plans

- Recognize ongoing detector and analysis efforts in the collaboration (speaking opportunities, internal review committees for papers, highlighting)

- Maintaining collaboration strength to complete PHENIX scientific mission is a challenge

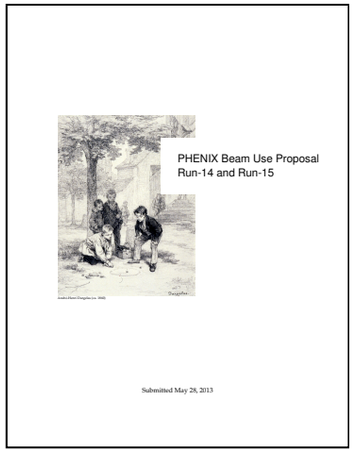
Highlighting young physicists in PHENIX

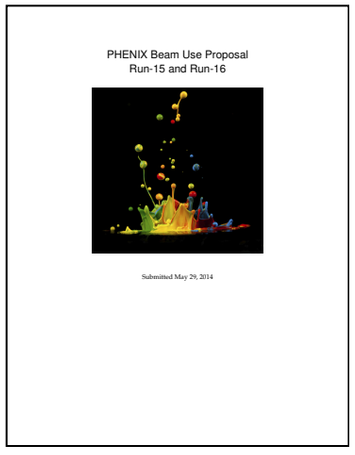


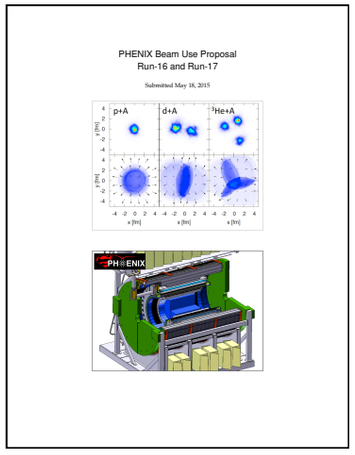
We pick two young PHENIX physicists each month to highlight in front of the collaboration – they give their institutional affiliation, describe their background, research focus, interests

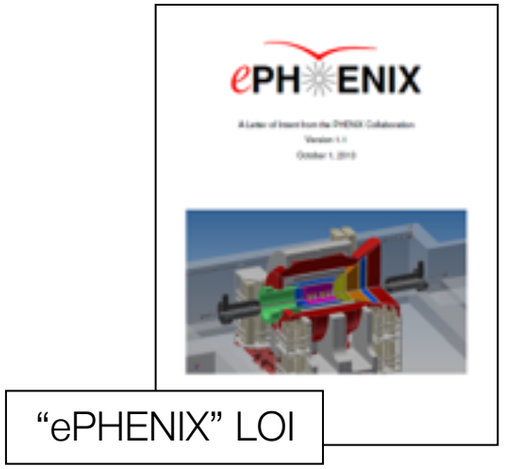
Collaboration argues for compelling science

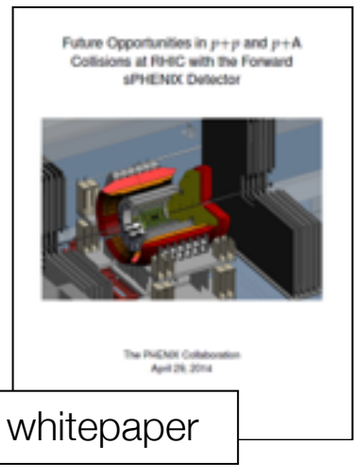
PHENIX beam use proposals

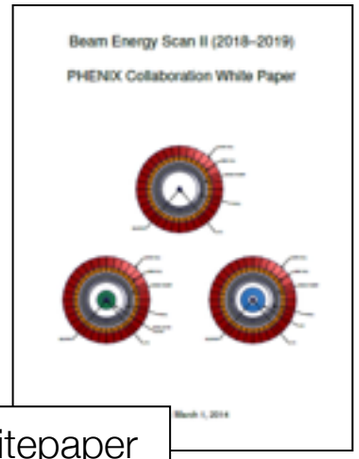












sPHENIX is part of BNL plan for coming years

2016: final PHENIX data taking

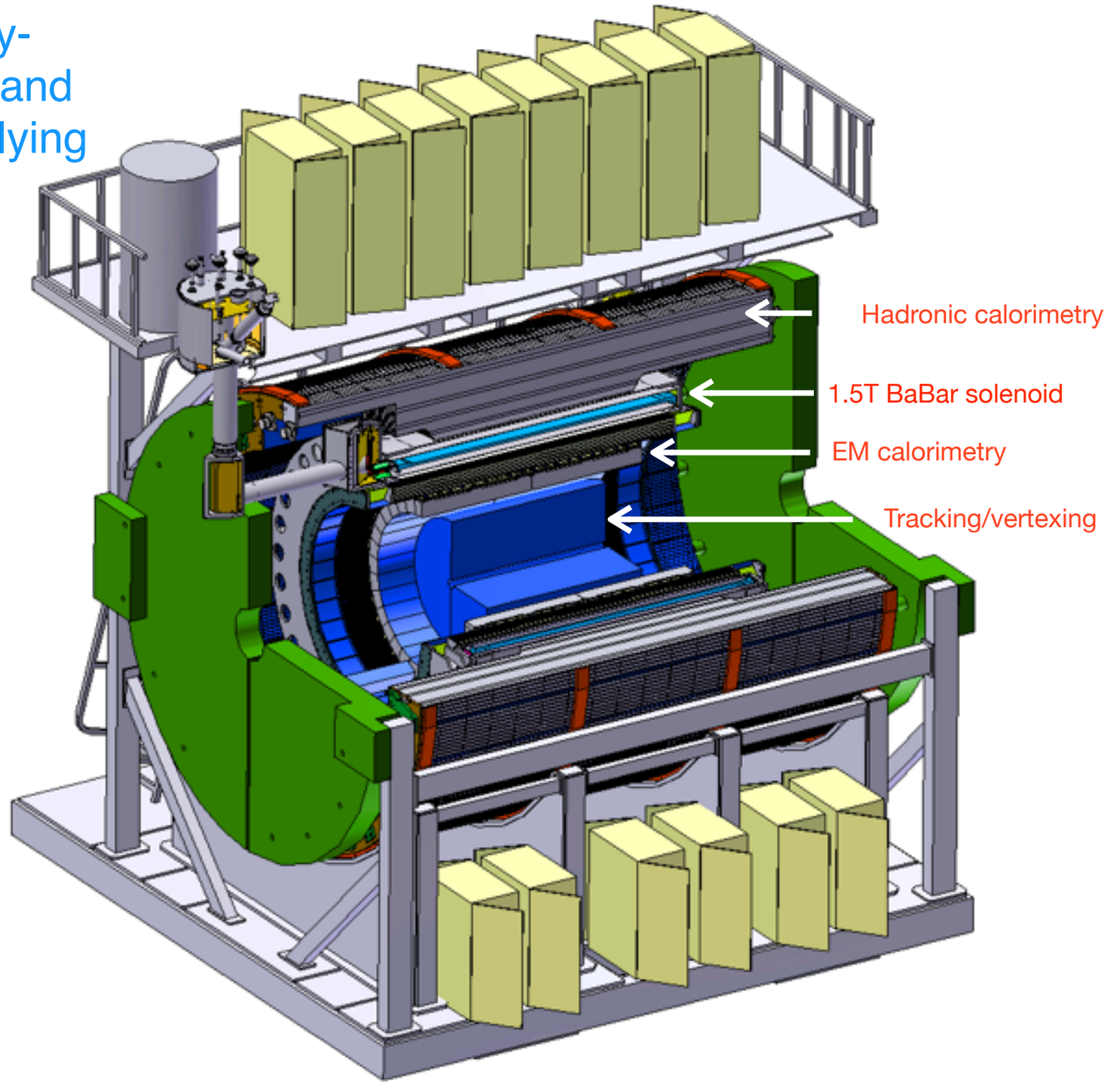
Years	Beam Species and Energies	Science Goals	New Systems Commissioned
2014	Au+Au at 15 GeV Au+Au at 200 GeV ^{3}He+Au at 200 GeV	Heavy flavor flow, energy loss, thermalization, etc. Quarkonium studies QCD critical point search	Electron lenses 56 MHz SRF STAR HFT STAR MTD
2015-16	p↑+p↑ at 200 GeV p↑+Au, p↑+Al at 200 GeV High statistics Au+Au Au+Au at 62 GeV ?	Extract η/s(T) + constrain initial quantum fluctuations Complete heavy flavor studies Sphaleron tests Parton saturation tests	PHENIX MPC-EX STAR FMS preshower Roman Pots Coherent e-cooling test
2017	p↑+p↑ at 510 GeV	Transverse spin physics Sign change in Sivers function	
2018	No Run		Low energy e-cooling install. STAR iTPC upgrade
2019-20	Au+Au at 5-20 GeV (BES-2)	Search for QCD critical point and onset of deconfinement	Low energy e-cooling
2021-22	Au+Au at 200 GeV p↑+p↑, p↑+Au at 200 GeV	Jet, di-jet, γ-jet probes of parton transport and energy loss mechanism Color screening for different quarkonia Forward spin & initial state physics	sPHENIX Forward upgrades ?
≥ 2023 ?	No Runs		Transition to eRHIC

sPHENIX proposal

sPHENIX is a proposed high-rate detector with a full program of light and heavy-flavor jets, direct photons, upsilons, and correlations to investigate the underlying dynamics of the QGP

Key observables:

- modifications of single jet spectra
- heavy-flavor tagged jets
- hadrons to high p_T
- fragmentation functions to high z
- direct photons
- high p_T Ds
- upsilons
- *X*+jet correlations



DOE review of sPHENIX science case, April 30, 2015 – no recommendations

Timely production of results

- Physics working groups and Analysis Coordinator help set priorities to schedule data for reconstruction

- Production Coordinator and Computing Coordinator work to define and continually refine strategy to speed availability of processed data for analysis

  - Full data set subdivided (e.g. central arm vs muon arm) to speed initial availability of processed data for some analyses

  - Considered placement of data on disk vs tape to optimize speed of reconstruction (involves close coordination with RACF)

- Initial reconstruction of data from each year finished within 1.5–2 years

- Reconstructed data is made available via “analysis taxi” – machinery for making a coordinated pass by many separate analysis modules over large data sets

Data Sets

year	E (GeV), species	Lumi*	upgrade	physics	reco status
2014	15, 200 AuAu 200 ^{3}HeAu	2.3 25	(F)VTX	Heavy flavor, Flow in small systems	
2013	510 pp	242	W trigger	anti-q helicity	
2012	200, 510 pp 193 UU 200 CuAu	4, 50 0.17 5	W trigger (F)VTX	anti-q helicity, geometry, Heavy flavor	
2011	510 pp 19, 200, 27 AuAu	28 0.8	W trigger VTX	anti-q helicity Heavy Flavor	
2010	200, 62, 39, 7 AuAu	1.1	HBD	low-mass dileptons	

Run-15: p+Al is fully reconstructed now – available for analysis

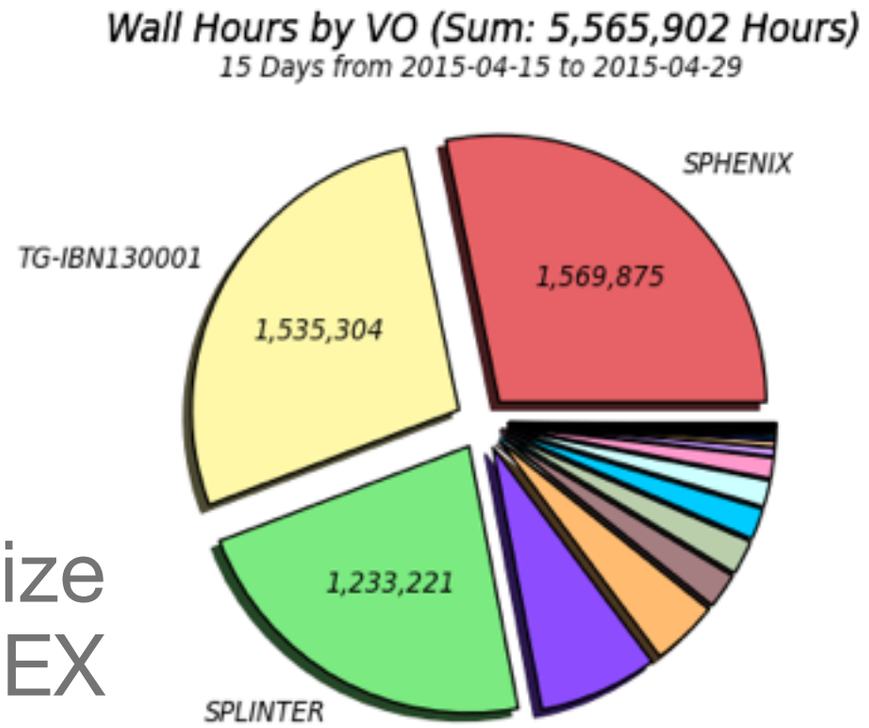
*Lumi: sampled integrated luminosity in pb^{-1} (nb^{-1}) in pp (highest energy HI); vertex range is narrow/wide/30 cm for heavy flavor, dileptons/W/others

Use of computing resources

- RHIC Computing Facility (RCF):
  - 15,000 batch computing slots, 8 PB storage for raw data and DSTs

- Open Science Grid:
  - large-scale simulations w/o impacting closer-to-the-data RCF resources

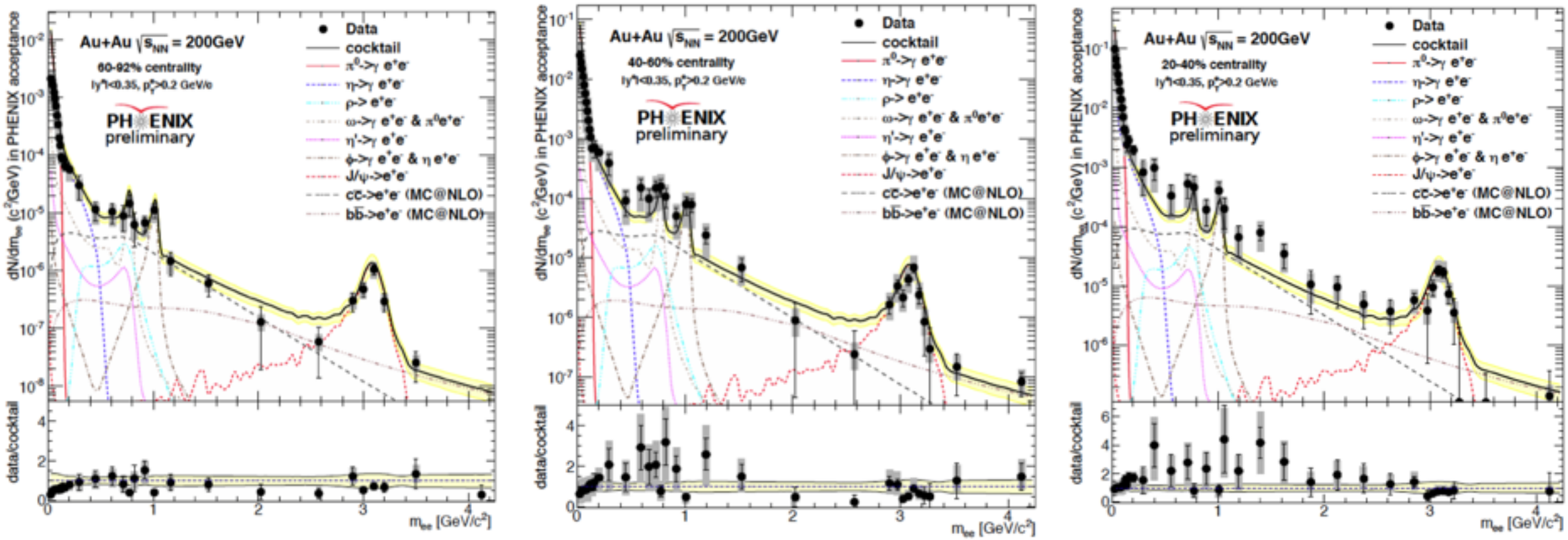
- Keeping pace with increase of data size
  - Added VTX, FVTX, W trigger, MPC-EX
  - Still recording data with > 5 kHz



Plans for key results in a timely fashion

- Many details in talk by Stefan Bathe at BNL/NPP PAC meeting
- HBD and VTX results
  - Low mass di-electron in Au+Au
  - Separated charm/bottom yields from Run-11 Au+Au
  - Both papers are on track for journal submission by QM'15
- Flow analysis of ^{3}He+Au – paper imminent

HBD Data Release Plan



Quark Matter 2012, arXiv:1211.6002

- Preliminary result for peripheral and semi-central
- Final analysis completed
- Paper Preparation Group formed December 2014
- Complete paper draft exists
- Plan: journal submission by September 2015

VTX Data Release Plan

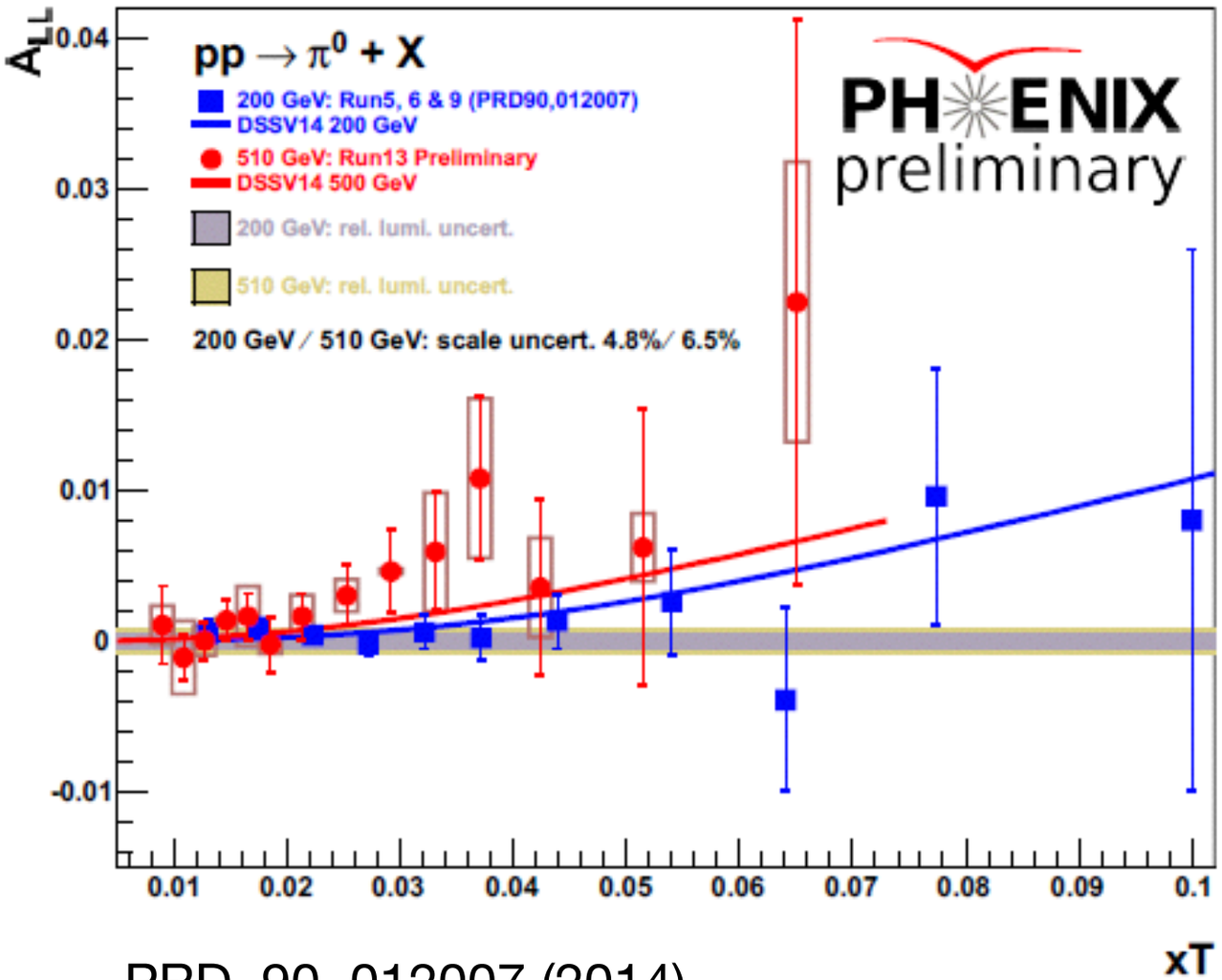
- Run11 Au+Au
  - Final analysis essentially done
  - Paper Preparation Group formed May 2015
  - Complete paper draft exists
  - Journal submission by September 2015
- Run14 Au+Au, Run 15 p+p
  - Analysis procedure established
  - analysis of Run14 Au+Au and Run15 p+p will be faster
  - preliminary result (50% of data) by September 2015
  - followed up by publication

FVTX Data Release Plan

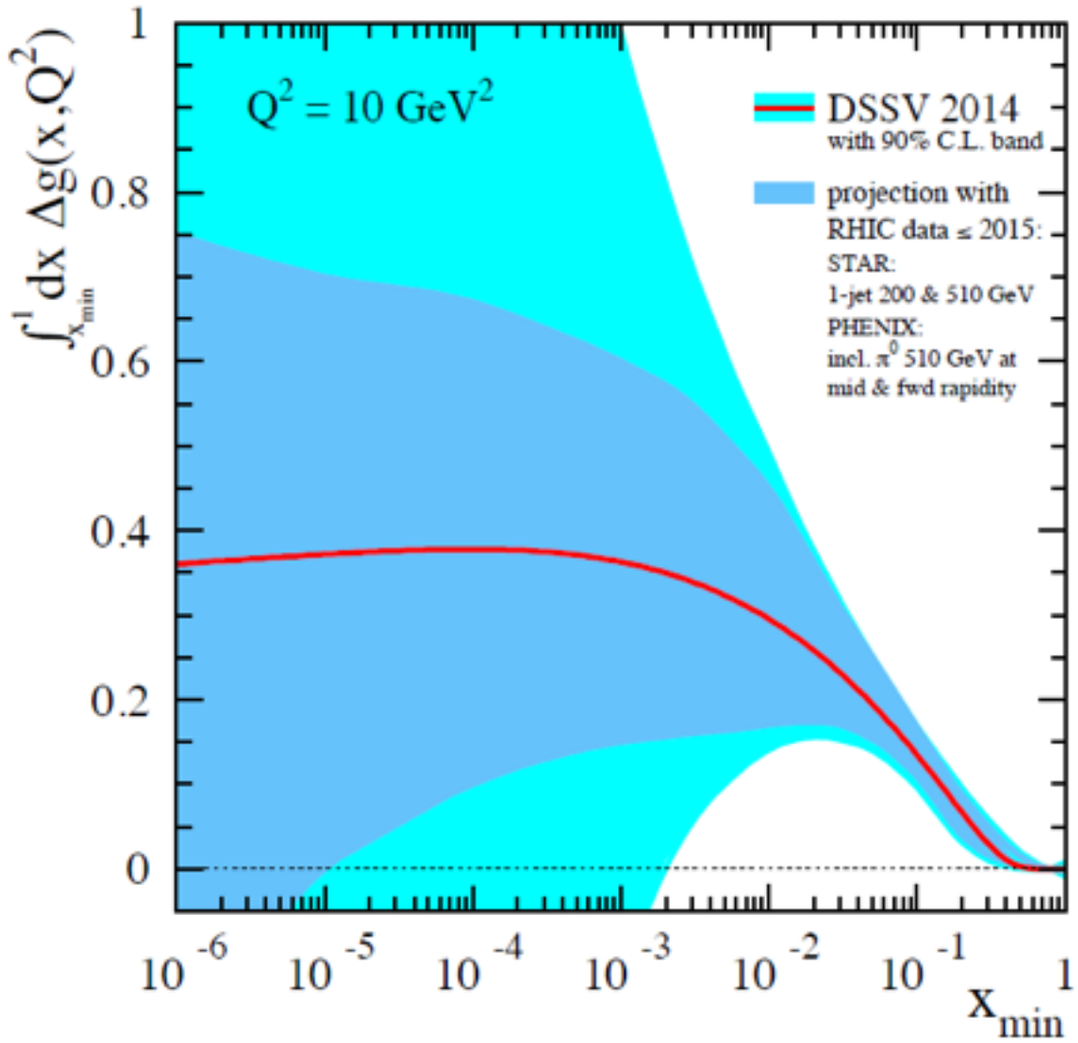
- Reconstruction status
  - Run12 Cu+Au, p+p: done
  - Run14:
    - Starting in July
    - 5 months to 50% completion (November 2015)
    - 9 month to 100% completion (March 2016)
  - Run15:
    - starting this week,
    - two weeks to completion (July 2015)

Goal: preliminary result from Cu+Au
September 2015

Gluon Spin Results



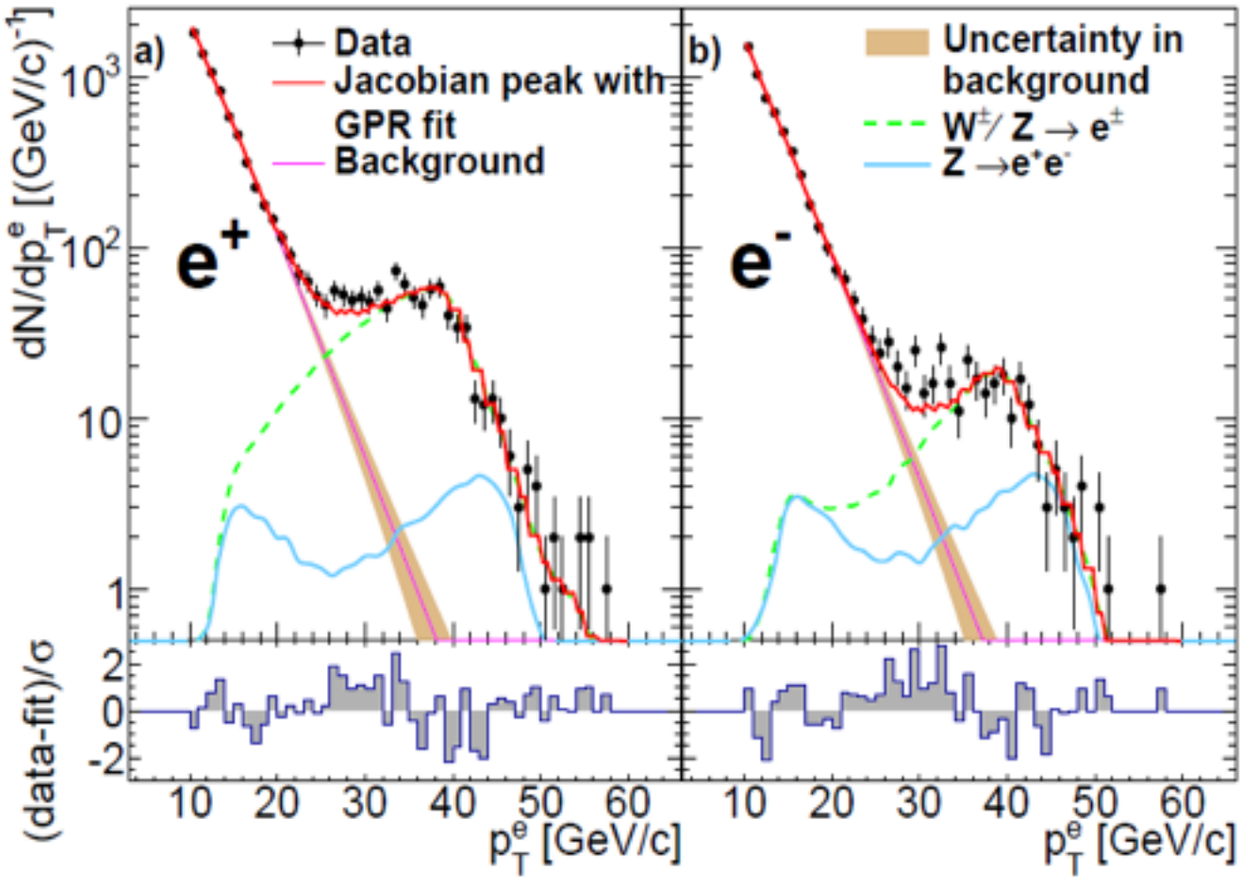
PRD, 90, 012007 (2014)
PRD, 91, 032001 (2015)

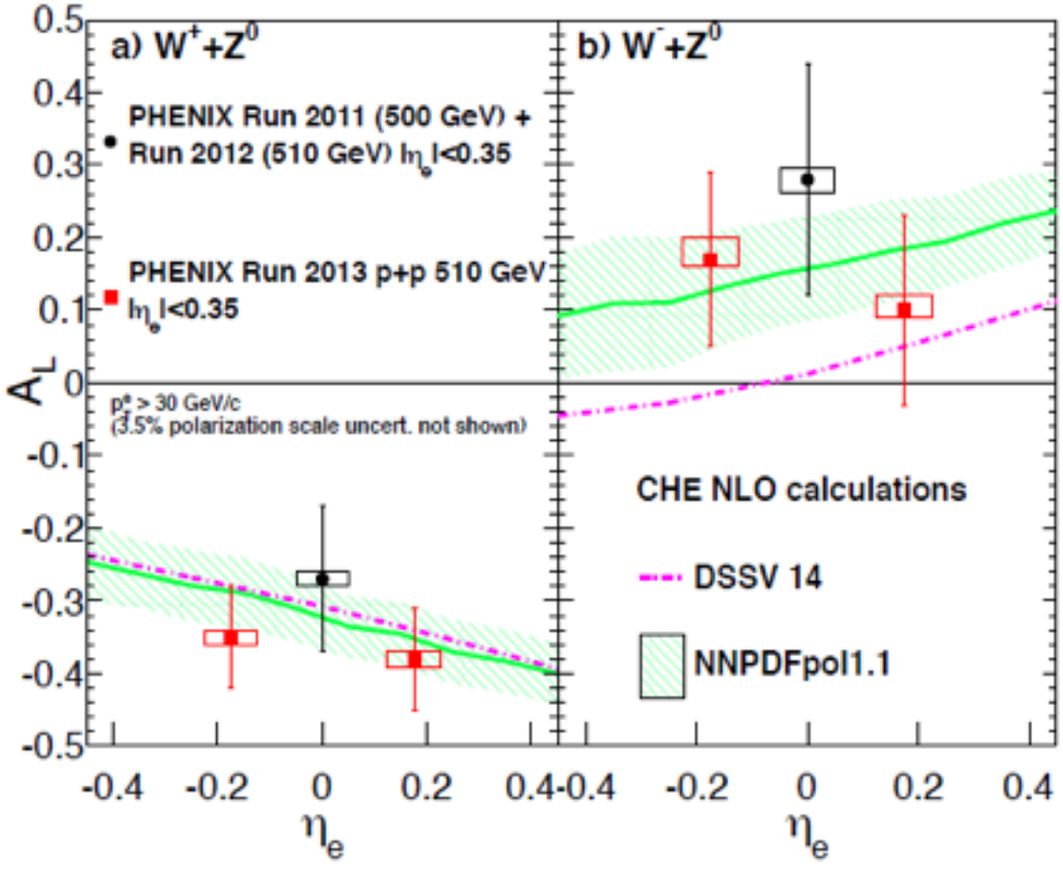


RHIC Spin White Paper
1501.01220

Finalizing Run-13 510 GeV *p+p* results

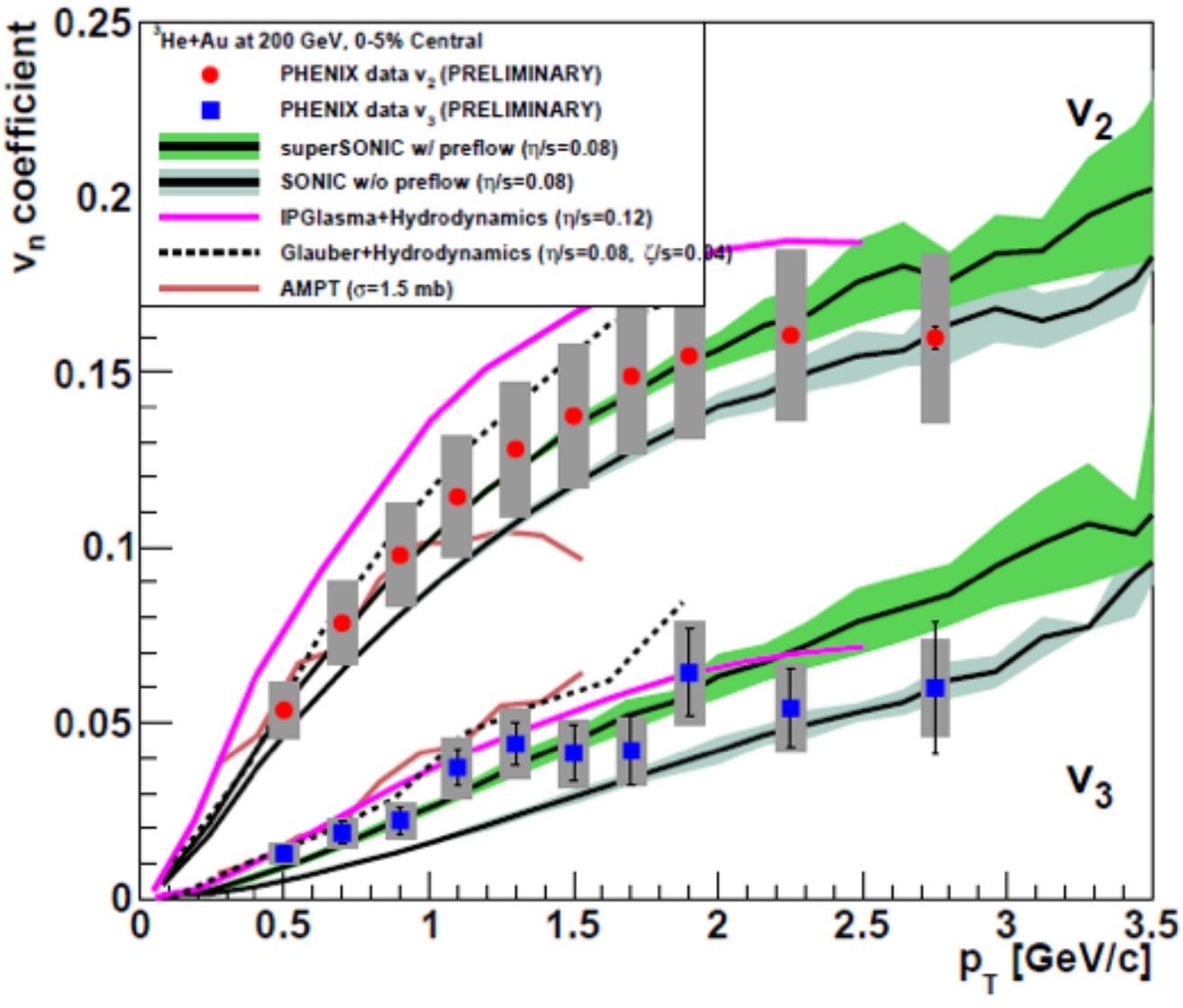
Mid-Rapidity W results





W→e results from Runs 11, 12, 13 submitted for publication
arXiv:1504.07451

Run14 ^{3}He+Au

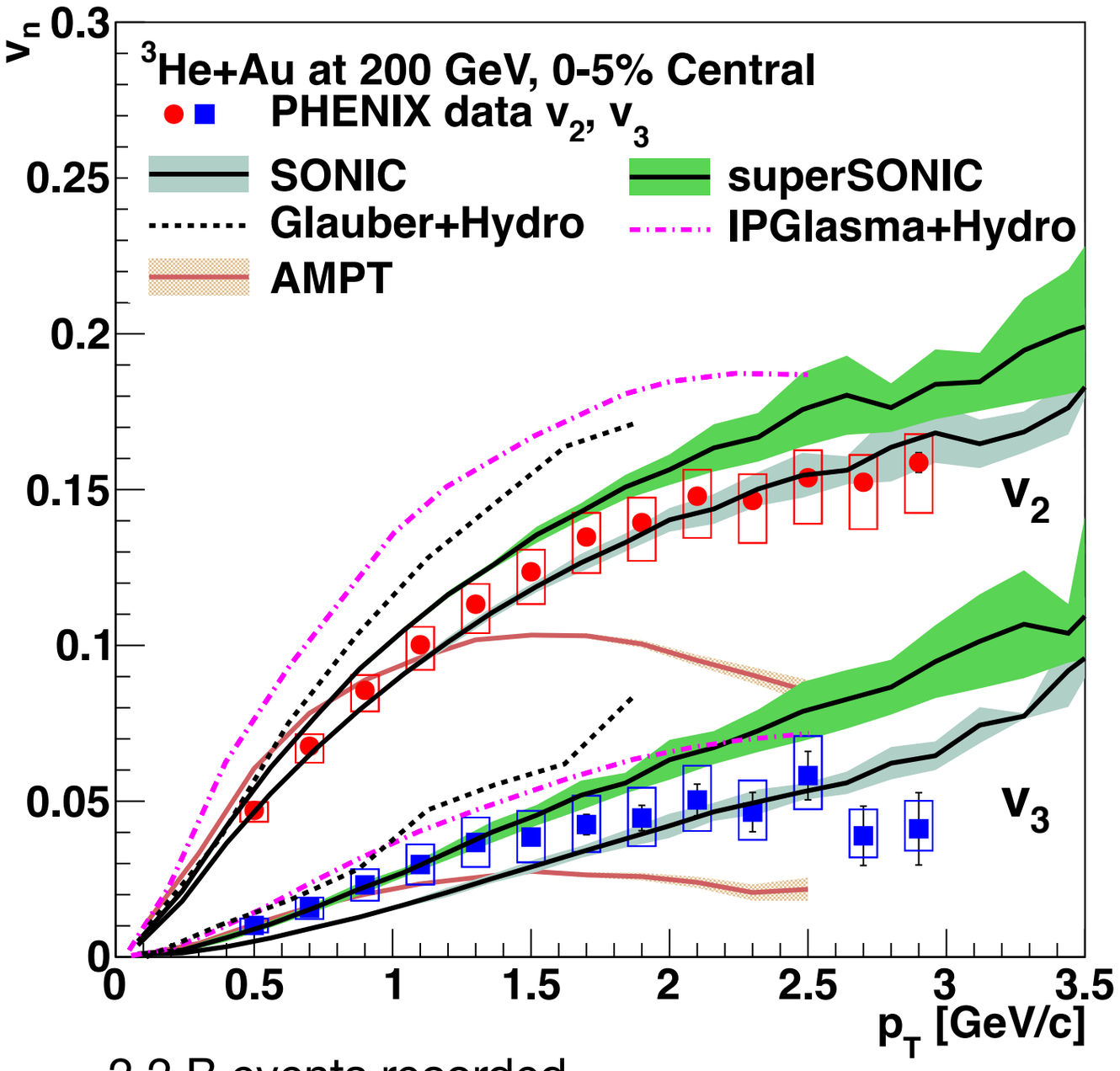


- Preliminary result shown at IS2014
- v_2 similar in ^{3}He+Au and d+Au
- Significant v_3 in ^{3}He+Au

- Publication Plan
- Paper Preparation Group formed February 2015
- Journal submission in July 2015

2.2 B events recorded
Centrality trigger
Enhanced 0-5% most central by nearly factor 10
Recorded almost all central events

Run14 ^{3}He+Au



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Publication Plan
Paper Preparation Group formed February 2015
~~Journal submission in July 2015~~

appeared on arXiv last night
arXiv:1507.06273

Summary

- Managing the collaboration toward the mid-term plan
  - Focus on key PHENIX deliverables
  - Effective interaction of PM, PWG conveners, Coordinators, Operations and Collaboration
  - Engage whole collaboration (paper reviews, speaking opportunities, highlight)
    - Emphasis on showing published results at major conferences
    - Involve collaboration in crafting future physics plan
- Approach to analyzing data in a timely fashion
  - Prioritize reconstruction of various data sets
  - Sophisticated exploitation of available computing resources
  - Emphasis on showing published results at major conferences (same as above)